Liberating energy analysis

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Keywords
energy policy research, social studies of science, technocentrism, morals, institutions, funding, evaluation, traditions

Abstract
The energy analysis research and policy community faces a strong internal set of traditions and curbs that are socially and fiscally desirable to follow. They take form in a set of conventionalized frameworks and assumptions, operating separately from and sometimes contradicting scientific ideals. These frameworks constrain what can be said and limit the scope in which hesitations, contraindications, and doubts can be recognized. This denial allows us to press on with our work, but locks out a possibly vital set of hidden knowledge and unaddressed questions. The community knows much more than it has found a way to work with. Toward liberating this knowledge, we focus on the field's constraints, so that they can become a topic of conversation and reveal potential margins of manoeuvre for change. We identify a set of frameworks facing energy policy analysts, implementers, and researchers that serve as a sort of motive power behind these constraints. These include the mundane, the need to please sponsor and colleagues, semi-commitment to pre-ordained findings, and the problem of funding restrictions, but also more hidden limitations, for example, results defy theory and thus become discountable, limits to the applicability and availability of numerical data, results or directions that tread on particular moral judgments, discouraging results, and lack of audience for an idea or finding.

Introduction
What if we, the energy efficiency research and policy community, could escape our political contexts and the natural tendency to deny disruptive results, and be direct about the programs we evaluate, the data we use, the conclusions we write, and what we think is going on with energy consumption? What if we could transcend the research agendas we react to and defend, and question and go beyond some traditional assumptions of the field and its accepted formulas for evidence? What if it became easier to offer and accept criticism, contrasting opinions, and evidence of failure, and to see scepticism not as enemy attack but as essential means of establishing solid ground? There are many pressures to not do so, but finding a way to overcome them could be a ticket to moving ahead. Instead, despite great tacit knowledge, many avenues are blocked or re-routed into forms that are more politically, financially, or otherwise traditionally palatable, even if only because we want to pose questions that we can answer. One by one, these reshapings often seem to be the best thing to do or the only thing that works. In total, they can derail us, limiting our frames and leaving us stalled on key issues and overpromising what energy efficiency can really do. Speakability constraints powerfully shape the questions that can be posed and conclusions that can be formally reached. Toward loosening the bounds of both inquiry and response, our goal in this paper is to make the topic of constraints itself more speakable, drawing it out from the frank coffee table conversations or private self-doubts to which it is normally limited.

Approach

What we want, in a sense, is to send the field to therapy. This is not a condemnation of energy analysis. Most of what we want to expose is already known by many, but recognized rather privately and coarsely. And while we would ideally like to use juicy anecdotes to illustrate constraints, there are systematic blockages to writing about and documenting such things. Everybody, including the authors, is a self-censor – let alone the layers of censorship (beneficial or not) that institutional and public review processes represent for policy-oriented literature in general. Thus we focus instead on identifying frameworks and mechanisms that help create the constraints that dictate speakability and unspeakability. Rather than attempt a comprehensive analysis, our goal is to bring the topic of constraints in the energy efficiency field more into the open. It is an area in which we all have experience, but these experiences are only narrowly shared. If the constraints are better and more publicly recognized, perhaps they can be better overcome.

In a critical analysis of sociology more than 35 years ago, the French sociologist R. Boudon (1971) described how the social and economic context that frames the production of scientific knowledge influences the nature and the orientation of this knowledge. This is true in energy efficiency research as well: institutional and financial constraints limit the scientific methods used, which in turns orients the problematisation and later on the theorisation process. As shown by P. Lannoy (2003), researchers' practices of construct the social legitimacy and the authority of their discipline on any phenomenon are "relative to the social configuration [of concurrent disciplines] that is always historically peculiar and changing and in which the dignity in terms of research investments is produced" (p. 523). A context of competing disciplines for (relatively) rare funding brings about rivalries and strategic positioning.

We draw on experience from our years in this field, from conversations with colleagues about their constraints and frustrations – of which we would like to hear more – and when possible, from documented examples in this and other fields. We also consider a few of the most controversial topics of the field, under the assumption that these controversies point to some of our sorest spots, threats to our esteem and our assumptions, of the sort that constraints are meant to protect. The discussion is organized in six interrelated categories of frameworks: (1) Political framework and the nature of evaluation; (2) Intellectual framework and the nature of evidence; (3) Economic framework and the type of research; (4) Emotional framework and assumptions about morality; (5) Scientific framework and the type of solution; (6) Funding framework and the need to make a living.

The field, its traditions, its critics

Like any professional group, the energy efficiency research and policy community has its own traditions, assumptions, and vocabulary. These vary by institution but generally include, for example, the idea that efficiency is good and nuclear power is bad (except in countries relying heavily on it), trust in measurability, a faith that one's work and one's own discipline is best to protect the environment, an arsenal of standard ways of analyzing things such as cost-effectiveness and market barriers, and the hope that others in the field are strongly morally committed to saving energy. Röling (in Douthwaite 2002: xiv) suggests the word "praxeologies": "that practitioners do what they do on the basis of theories ... and that it is better to make these praxeologies explicit and discursive than to leave them implicit or tacit." No book adequately explains these to an outsider. To insiders, traditions and assumptions are taken for granted, at least in the workplace. They are barely visible except occasionally at points of higher education and on the occasion of the soft historical ruptures typical of the field. They may not be well-justified or explained, but they are convenient and appealing. In addition to this rather formal set of traditions, there is a set of informal traditions within subgroups (architects, weatherization specialists, marketing people, forecasters, government standards analysts, etc.), or discourses with themes that emerge as traditional and that often counter formal theories and official expectations. For example, there are stories about what technologies don't perform as billed (e.g., demonstration house retrofits that use more energy after retrofit than before, smart controls that weren't, etc.), what sentences were struck and what results were left out of the published report, how builders work around disliked standards, what mistakes were made, etc. Yet these anecdotes have trouble in collectively informing the field's formal traditions.

A number of papers have already addressed the conventionalization of energy analysis from various directions (Archer, Pettigrew, & Aronson 1992; Herring 2006; Jelsma 2004, Lutzenhiser & Shove 1999; Shove & Wilhite 1999; Stern 1986; Stern 1992; Wilhite 2001; Wilhite & Nørgard 2004), with others questioning various individual assumptions specifically (e.g., Blumstein *et al.* 2000; Deumling 2004; Golove & Eto 1996; Nevius & Pigg 2000; Nørgård 2005; Shove & Moezzi 2000) and perhaps hundreds apparently obliquely or directly critiquing various assumptions by way of "further research is needed." These critique some key themes of the field, such as market barriers, cost-effectiveness, models of decision-making, assumed relationships between efficiency and reduced consumption and between efficiency and reduced carbon emissions, the greenness of efficiency, etc. It is not as if there is no critique. It is that there is not enough, and that critique (generally focusing on formal rather than informal assumptions) is not enough.

Before proceeding, we make a few observations about the field. First, there are elements of war here: a basically small, on the whole committed group of people –in aggregate largely dedicated to changing what 'others' (the consumers or those of other disciplines) do or think, and now battling the tendency of the world to use or waste more and more energy, seeking rationality and morality in their targets. Some of the vigour of the field may have given way to depression and frustration: whatever good energy efficiency has done and can do, it hardly seems up to the global warming giant against which it has become pitted – especially under the condition that efficiency must be good for the economy too. If it cannot succeed alone, then with what other approaches and with what claims to its own contribution might it proceed? Second, in day to day working life, some "overflows" to conventions (to borrow terminology from Callon 1998) are regularly acknowledged: that people don't really make many decisions based on cost-effectiveness, that assumptions or data are weak, that certain

claims made aren't scientifically correct, etc., but these are nearly as regularly set aside so that "normal science" can continue. While some conventions are malleable insofar as satisfying new conventions take their place, the lynchpins of engineering and economics are robust against contenders. Third, the energy efficiency field is the collision of various diverse systems with logics of their own – regulators, academe, technologists, implementers, industry, policy analysts, marketers, environmentalists, etc. – and thus various systems that hold it into place as a never-granted and moving constellation of potentially contradictory interests.

Frameworks and constraints

POLITICAL FRAMEWORK AND THE NATURE OF EVALUATION

It is not so easy to find, on paper, evidence of a failed technology, or a failed program in the energy efficiency field, especially past the 1970s-1980s prime. "Lessons learned" slots, popular in the 1990s, have usually been filled by assurances that everything went well. This tendency to rosy evaluation obviously transcends the energy efficiency field. In investigating the structure behind successes but more often pitfalls in diffusion of technological innovations, particularly in international development, Douthwaite (2002) describes how a thousand rice stripper-gatherers were produced for an in any case ill-conceived plan for doubling Burma's rice harvest. In the end none of these machines were functional despite positive reports about how well they worked. "Later, away from the armed guard [who had been sent to accompany the author on his visit], my translator told me that it was not uncommon for tractor stations to give optimistic reports about the performance of equipment dumped on them because positive feedback was better received. Several months later I met the tractor station manager at an international workshop, where he had been sent as a reward for being successful" (Douthwaite 2002: 6). No doubt Burmese agriculture is a harder case than energy efficiency policy must usually face, but it is true that in most chains of evaluation, almost everyone has pressures to report good outcomes to their boss, their funders, whatever the results seen on the ground. One sees this often in the diffusion of energy technologies: things that should, in theory, work, but don't; or at least "not yet" are depicted as working – or at least as something following a few one-off changes would have fixed, as commonly the case in demonstration buildings, Green (Janda *et al.* 2004) or otherwise. Faults are hidden – which makes them harder to fix – and theoretical estimates of savings reign. For example, programmable thermostats are one of the first things recommended on lists of energy conservation provided to American households; not surprisingly, since they are an inexpensive upgrade that on a theoretical basis provides a nice chunk of savings wherever there are substantial cooling or heating loads. However real experience shows that there may not be any savings at all (Nevius & Pigg 2000). Of course not all evaluations show good results, but there can be trouble when they don't: "the potential for conflict has long been recognized … and we are far from the first to discover that evaluation is an unloved profession" (Archer, Pettigrew, & Aronson 1992). "The truth is already showing up through the care it takes in escaping observation" (Lévi-Strauss 1959 and 1984: 61).

It is not only in formal evaluations that the conflict arises. At a recent U.S. conference on energy efficiency in buildings, the post-presentation conversation turned to discussing inordinate problems many installers had had working with and properly adjusting variable speed heat pumps. Yet in the end, when asked whether they still installed these heat pumps, the response was "yes of course." The trades know a great deal that laboratory and policymakers don't. Obviously technologies and programs sometimes work very well. But they often do not seem to work as assumed and their failures are often ignored or heard only in round-about ways – as anecdotes, from "below", and rarely written – and conveniently attributed to human folly rather than something more fundamental. What if more of this sort of assessment could actually be disseminated without falling prey to being denied or discounted? In a context of competition for symbolic and financial domination in the field, the roots of censure are entangled with those of the evaluation system, broadly speaking, but also with strategic, if not necessarily conscious, lack of self-reflectivity, politeness, social hierarchy, and a reluctance to suggest shortcomings about what is tacitly defined as Good, such as daylighting (see Vaidya *et al.* 2004), or smart controls, or environmental labelling. The evaluation problem is really just a subset of a more overarching sort of restriction, governing what can be questioned and what cannot be: we produce the best work, or the best-looking, work we can, that meets a structure determined elsewhere.

INTELLECTUAL & INSTITUTIONAL FRAMEWORK

Technocentrism

While energy use is an extraordinarily social phenomenon, the field has the technological aspects of energy use at its core. Since the 18th century, the Enlightenment century, science and technology have aimed at replacing religious beliefs and tradition by a faith in Reason and a project "to rationalize human life" (Bonny 2004). B. Szerszynski (2005: 53 *et sq.)* argues that "it was the emergence of the Protestant sacred, with its transcendent, sovereign deity and passive matter, which enabled the development of technology in the modern sense. Technology came to be seen … ultimately, as a fusion of art and reason, of techne and logos, which promised to bring the certainty of reason to humanity's technical dealings with matter." (pp 63-64). Technology becomes systematized, with an explosion in the scope and purchase of technique, and its harnessing to the goal of shaping and optimizing life itself (Szerszynski: 53).

What are the consequences of this cultural shift in terms of social structure? B. Szerszynski (2005: 64) argues that during the last centuries and especially so during the last one, "technological activity became displaced from its lowly social location in the artisan sector of the society, and increasingly taken up by the emerging scientific elite." If we go a little further in this way of thought, we can hypothesize that continuing to problematise energy analysis in technological terms is a way of keeping up engineers social status and its ability to generate income if not markets, not to mention a way of providing problems with neat "solutions", whether effective or not. There are mountains to be made in calling ones' product green now, a market transformation that can hardly be considered an environmental success. Let alone the recognized difficulties in defining greenness, sustainability, and the like, greenness readily becomes a way of

lowering consumption-guilt and funneling broader concerns into the market, where the promised magic brew has so far been disappointing.

Numbers and stories

Whether evaluating an entire program or delivering a requested number to a client, many energy programs and decisions are justified by a sufficiently large savings number or cost-effectiveness number in some cell or other of an Excel spreadsheet stored somewhere in the world, a boon to funding or some other type of hope. We want to make four points about these numbers. First, the numbers in such cells are made to stand up to particular conventions of derivation and standards of defensibility, but these are generally of the "this is the best we can do to get this number" rather than a higher scientific scepticism. If there is one first lesson about trans-disciplinarity it is that someone in one discipline might often be shocked by what passes for science in another –even as we doubt that any universally satisfying science is possible. Second, these are also attached to a specific context and series of assumptions but these conditions are not, and usually cannot practically, be carried along with the number; the conditionalities on the number are lost. Third, there is an infinite pool of energy to be saved and carbon emissions to be reduced: energy savings are necessarily measured relative to a fictitious baseline and through technological changes because the baseline is so open (cf. Boonekamp 2006). It is convenient to choose a reference system that makes the proposed or actual program or change look good. Four, an Excel spreadsheet is not the best tool to handle statistical multivariate analysis, paradoxes, vicious or virtuous circles, but it gives fast and clear results: institutional and financial constraints limit the scientific methods used, which in turns orients the problematisation and later on the theorisation process, as shown for sociology by Boudon (1971).

In part because of the isolation of the field and its apparently technical foundation, numbers are ensconced based on very particular notions of defensibility – for example, they came from a large model or large bureaucracy – rather than their reasonableness and consistency with other data. This may be particularly true in the United States where the funding base for energy efficiency is fairly narrowly controlled (Lutzenhiser & Shove 1999). In part this is because "reality" is so difficult to observe when it comes to energy consumption. It may be very difficult and expensive to obtain "real" data, if indeed it is a case where real data can be conceptualised at all (e.g., for forecasts or intangibles).

Multiple realities

Thus Excel, or other models, can serve as a compartmentalized reality tidily summarizing the world and the good we have done or can do in it. The philosopher Alfred Schütz suggested a model of daily life as constituted by a succession of "multiple realities," each realm a finite province of meaning with a specific cognitive style, all taking place in the inter-subjective, inter-objective world where we touch, move, sense – where all reality must ultimately fit. For example, there may be a realm of dreaming, a realm of watching a movie, a realm of work, a realm of internet, and of special interest here, a realm of scientific theorizing (Schütz 1945). One moves from one reality to another many times a day, treating these realities as separate and generally not transferring the logics of one realm to another nor remarking on inconsistencies. This is useful for thinking about self-reflectivity in the energy policy field.

We regularly assume, in the course of our work, things that conflict with real-world experiences – for example, that "average" advice on how to save energy is useful, that energy-relevant decisions are made in a simple rational manner, or that if the environment is important people will go correspondingly out of their way to protect it, etc. Archer, Pettigrew, & Aronson (1992), a trio of academic psychologists who took the trouble to write a paper about the troubles they had in saying what they thought when it came to state wide energy program evaluation they were hired for in California: in describing some rather acrimonious meetings, they noted "[I]nteractions with utility representatives had strikingly different qualities depending on whether PUC staff (a regulatory agency) were present. In the presence of PUC staff, for example, the representative of one utility responded angrily with an impassioned defence of his utility's work. After the session, however, with the PUC staff safely out of hearing range, this same person said 'I'm surprised you guys weren't much more negative – those programs were real cripples, but they were done before I joined the company" (p. 1234). Surely similar situations are echoed nearly everywhere and frequently – such as in the stripper-gatherer example given above as well as in our own field. There is no surprise that our field is political. But what is striking is how stark the contrast from one role to another might be. For another type of example, Bartiaux *et al.* (2006) note that they "have met or heard of an architect who has completely remodelled his house while keeping the old single-glass windows; of an adviser on environmental matters who keeps developing the old electrical heating system of his house; of a consultant who has worked in bio-climatic construction who will insulate his 4-façades and traditional farm after all the other renovation works that he plans to do and of several engineers owning a poorly insulated house" (p.153). On the one hand, there is no logical requirement that one must "believe" in one's job or consider it to be an overarching or uncompromised mission. On the other one, there might be something useful for liberating energy analysis about the irony in these or other real-world situations.

We want to tell a story about one leading energy agency in the U.S., which must go unnamed, that routinely supports programs designed to impel consumers to install compact fluorescent lights (CFLs). As usual, advantages to pocketbook and environment are stressed, and installation is promoted through rebates, give-aways, and other programmes to break down perceived barriers to CFL use. There is nothing unusual in that. It is just one of hundreds of such efforts worldwide. In this case, growth in CFL penetration has been no better than moderate, to consternation of agency leaders. But what should we conclude if we heard that some of the highest leaders of these agencies, pondering in public why consumers do not buy more CFLs, have no CFLs in their own homes? This is not a moral allegation of hypocrisy. These leaders, by definition, have reasons to not install CFLs – or more precisely, they feel no sufficiently compelling reason to install them, even as a symbolic gesture. But the fact that they don't while puzzling over why others don't reveals a crucial disconnect between their realm of scientific theorizing and their domestic "decision-making" context, and

between their reality and what they imagine others experience. Perhaps closer to home is the travel dilemma – some of us, who either directly or indirectly are engaged in efforts to curb the world's energy consumption or energy-related pollutant emissions, have to and often love to fly. But flying emits lots of greenhouse gases, among other things, more than those CFLs are going to save. The problem of flying is an annoying example, but illustrates a principle that resists being rationalized or carbon-credited away. Models of the idealized consumer, whether economic man or environmental man, both popular in our field, apply to some people and some degree, but fall short as default models of human action for our field. But while we see why these models might not apply to ourselves, "others" are often seen as worse polluters and/or less scientifically equipped to tackle energy issue. This way of viewing the others is in line with the process of mental compartmentalisation (used in consumers studies but also applicable to researchers) "to signal social normality" (Halkier 2001: 39).

ECONOMIC FRAMEWORK AND THE TYPE OF RESEARCH

Most governments have a market-based strategy to energy management and a basically capitalist approach to problems, and see their societies as basically consumerist too. Thus many energy policies, as well as their preparatory research, are oriented to the market in providing consumers with adequate price signals reflecting, at some level, the cost of supply or environmental externalities, or otherwise revealing "true" costs of consumer activities. This perspective has engendered many studies on Tariffs of Use (or Time of Use, both TOU), and on environmental labels as it has for appliance labels or for the energy performance of a dwelling, as in the European directive on the energy performance of dwellings. It is not that TOU are not effective at some level and to some customers, but it is mistake to insist that TOU *must* work so that corrections to the model, and evidence and reasoning to the contrary, are dismissed or rationalized away.

Beyond this basic economic framework, energy efficiency relies strongly on the field of economics to describe problems and their solutions. Paul Stern remarks, "Like the proverbial drunkard who looked for his lost keys under the lamppost because that's where the light was, policy analysts have looked for answers to their questions about energy use in the light of economic theory" (Stern 1986: 200). With the pre-eminence of the economic paradigm, it is assumed that the market will solve energy scarcity thanks to better-informed consumers. The emphasis is thus directed to the moment of purchase rather than to the period of use of the appliance or the way of inhabiting a dwelling or constructing a way of living. Social scientists and all others writing in English in this field are stuck with little alternative other than using the term "consumer" when talking about individual behaviour. Even if it is noted that these consumers "consume" energy services, the economic lens blinds us to the basically non-economic aspect of most human habit and action. The assumed framework is rarely questioned and there is little research to evaluate its relevance, in part because no contending system has arisen to take its place.

One basic reason for the popularity of economic models is that they are elegant. They add coherence to an otherwise incomprehensibly messy world and are often useful in structuring dynamic arguments about it. However, from a scientific point of view, what is remarkable is that economic paradigms in the environmental field have become so strong that challenges to its basic assumptions, and failures of structure and explanation, are so readily brushed aside so that the paradigm may be maintained, as Callon (1998) observes for the model of environmental externalities. As to the role of economic signals in energy-relevant choices, evaluating researches have often shown their weaknesses. When buying a house, people in Denmark are not using its energy performance as a criterion (Gram-Hanssen *et al.* 2007); later, they do not apply so much the customized recommendations to save energy they have received, just as found, in another context, for Belgium (Gram-Hanssen *et al.* 2007). Furthermore, a market approach is not likely to encourage, nor financially support, research on voluntary soberness in energy consumption. Some of the greatest success stories in energy savings have been distinctly not caused by economic arguments – in particular, for war efforts and energy crises (see IEA 2005).

This is perhaps also a good place to bring up the role of social sciences – sociology, anthropology, psychology history, demography, etc. – in the energy efficiency field. For those that are technology oriented, people and technology are rather sharply divided (Jelsma 2004), and either one or the other must be the problem. The role of social science becomes compartmentalised, more or less, into one of behaviour, or more precisely "why people don't behave as we want them to and how to make them." This makes it difficult for the field to hear, for example, that, though human action can always be conceptualised as a series of "decisions", a formal decision-making process has little applicability to everyday life and the energy use within it, or for example, that, even if you inform somebody that turning the thermostat to High doesn't make it heat up any faster, they will still do it. Higher-order social patterns – changes in living styles, expectations, political systems, national styles, historical trajectories – are all but invisible. As stressed by E. Shove (2003: 198), "The vast majority of environmentally significant consumption is not a matter of individual choice, green or otherwise. It is instead bound up with, and constitutive of, irredeemably social practices "governed by norms like respectability, appropriateness, competence and excellence" (Harvey *et al.* 2001). But among those that are from the human and social sciences, there is also no agreement either on the paradigms to be used, or on the legitimacy of energy as a relevant and legitimate topic of study. For example, for many French-speaking sociologists, ordinary consumption practices are simply not a topic of a sociological research for the focus is on individuals or households, not on social processes or entities.

EMOTIONAL FRAMEWORK AND THE ASSUMED

Following J. Ellul (1964), B. Szerszynski (2005: 59) shows that "technology in modern society seems to promise a this-worldly salvation by removing uncertainty from human affairs" and that "fundamentally, technique becomes an end in itself". Thus no individual steers the technological process. Rather than individuals being the wielders and directors of technology, they are, as he quotes from Daly (1970: 419) "responsible only for seeing that the technical act is done correctly". For Daly, technological systems are imbued with quasi-supernatural agency and power. B. Szerszynski (2005: 63) concludes that "technology is loved for itself, apart from its fitness for human life and purpose." This

fascination lacks critical reflexivity, which is however often seen as a characteristic of modernity (Giddens 1990).

Efficiency appears to be purely technical but the drive to pursue it has strong moral basis: to reduce waste but to do so without disrupting activity ("you can do anything you want as long as you do it efficiently"). The goal morphs to conservation – disrupting activity – in times of war, shortage, or perhaps other calls to collective effort. How this works depends on the country, and is heavily influenced by historical trajectories, such as wartime conservation remnants or reactions thereof, energy dependencies, and national projects of technological development. If the proscribed attitude for energy efficiency research and policy community on the prospects for the field can be described in two words, it might be "Be positive" in attitude and action. As to attitude, earnestness can run to folly, especially when scepticism and cynicism are unwelcome. As to action, there are limits to the value of "simple things you can do" lists, especially as consumption or emissions reduction probably must involve not doing in the long run.

If to the outside world the field is the ultimate in dry, over the years there have been some topics that have generated strong emotions, censure, or curiously stunted dialogues. These include, for example, the issue of takeback, air conditioning especially as it relates to the developing world and more broadly the role of energy efficient technology transfer in shaping development paths, the relationship between energy conservation and economic development, relationships between efficiency, conservation, and productivity on micro- and macro-economic scales, and the relationship between energy efficiency and carbon emissions reductions. Reasons vary, but generally problems have been successfully defined, redefined, or ignored so that efficiency (however *it* may be defined) retains full value.

SCIENTIFIC FRAMEWORK AND THE TYPE OF SOLUTION

P. Lannoy (2003) has shown how most of the research on traffic regulation has been done by engineers whereas the first research in the field had been realized by one sociologist of the Chicago school. Most of his analysis applies to the field of energy as well. Engineers have indeed dominated the field of the analysis of residential energy consumption. So the main assumption is an ultimately technological solution and the faith is in Reason and its universality as well as in technological progress: "The man as defined by the western philosophy since the 17th century is a unified subject, [who is] independent, mastering nature both intellectually through science and practically through technique, defining freely his relations with others in the framework of inter-individual contracts" (Bonny 2004:73).

By invoking the universality of rationality – and in France, followed by Belgium, then expression for "energy efficiency" is, literally translated, "rational use of energy" – technical experts conceal the issues of conflicting rationalities and of struggling for socially imposing their own rationality (Bonny 2004: 72). With such a faith in the universality of Reason, it seems as if there is no point in evaluating technology-based policies or technological advice. In a recent Belgian research associating sociologists and engineers, the former proposed the latter to assess the implementation of the technical and customized advice the engineers had given to 40 volunteering households. This proposition was received as a strange and doubtful idea… and the result established that only 11% of the recommendation had been put into practice one year after the assessment, showing also the limits of a technological solution (Bartiaux *et al.* 2006).

FUNDING FRAMEWORK AND THE NEED TO MAKE A LIVING

Operationally, this is the most familiar kind of constraint. Markets need buyers, buyers (as well as sellers) are sometimes researchers or policy professionals, researchers and policy professionals need funding, funders are limited, and funders – and every other stakeholder in a policy or research effort – have stakes. This set of dependencies restricts the questions that can be asked, and the answers that can be given. No science is so pure as to escape such limitations, and the resistance of individuals almost inevitably gives way to the realities of institutional self-preservation. The fear of losing funding can be taken to extremes, leading to great timidity for some large institutions. Silences and censure are not only unscientific, they make progress hard. We are likely sitting on thousands of studies with problematic results audited, key sentences deleted, abstracts rejected, papers unpublished, and most of these stories will be silent. For the sake of all, corporate or institutional policy often does not allow all things to be said. We have mouths to feed and *curricula vitae* to populate. Dead men tell no tales. People who are too critical are shunned, attacked, lose the chance for another contract (Archer *et al.* 1992), or lose their jobs (Gilman 2006). In part this has to do with the narrowness of the funding base – perhaps particularly in the United States (Shove & Lutzenhiser 1999).

Consequences

Blocked dialogues constrain the field, and are partly responsible for leaving the community in the dreary position of promising more than can be delivered, of having to continue down paths once successful but that now yield small rewards or worse, of building imaginary worlds that don't ring true, all accompanied by the frustration that despite good work, favourable results on many small tasks, and a great deal of dedication, a realization that we are not up to the challenge or that the challenge that we are up to is rather too limited to say out loud. Maybe it does not have to be like this.

Reorientation

This conference paper is not going to make much of a difference. Constraints hold up because they are functional or at least because they are believed to be so. But talking about things might. Let us find ways to hear departures from theories, and to collect and consider the knowledge that gets set aside. Let us remember that climate change is not just a funding opportunity. Let us say what we think without letting fear of lost funding stop us, as researchers let us have faith that some clients want to know, and as clients let us try to make sure our questions leave enough room. Let us question tacit assumptions, let us not be too hurt or defensive by criticism or our work, projects, and beliefs, and let us not dismiss those who disagree. Let us instead encourage reflexivity and build a constructive discourse rather than battening down our acronymed niches where we are almost sure to prove successful. Let us better share

our doubts, let us try to make a discipline that is more exemplary in courageously combining engineering sciences, social sciences, epistemology, and policy in ways that make a more robust kind of sense.

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